REMARKS

Claims in the Application. Claims 30, 57, 70, 77 and 84 have been amended. Accordingly, Claims 30-36, 39, 57, 60-61 and 64-90 are active in this application. Reconsideration is respectfully requested.

Examiner's Rejection Over *Burdick* and *Boatman*. The Examiner has maintained the rejection of Claims 30-36, 39, 57, 60 and 61 and has rejected Claims 64-69 and 77-83 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,479,573 ("*Burdick*") in view of U.S. Patent No. 6,315,061 ("*Boatman*"). This rejection is traversed.

The Examiner concludes that the method of *Burdick* and *Boatman* is not distinguishable over the method of Applicants:

> Moreover, . . ., because the process suggested by Burdick and Boatman is encompassed by the method recited in the instant claims, then the process suggested by the prior art should be considered as 'thickening a brine . . . to alleviate loss of brine' because the resultant method and brine in both the instantly claimed and prior art processes provide a resultant drilling fluid that is thickened with a brine that is having higher density due to manipulation of the formate salt content density. It is unclear as to why the process of Burdick and Boatman would not 'alleviate loss of brine' if it involves adding a viscosifying cellulosic suspension to a drilling fluid containing the same components as recited in the present claims. (Page 9 of Office Action.)

Applicant respectfully disagrees with the Examiner. The claims of Applicant are not directed to drilling but to recovery of oil and/or gas from a formation. Drilling precedes recovery and is not synonymous with recovery. Both *Burdick* and *Boatman* are drawn to the drilling stage of a well and not to the recovery stage of oil or gas from the well. Applicant's invention is not directed to the thickening of a drilling fluid. The thickening of the brine claimed by Applicant has nothing to do with the drilling of a well or drilling muds used in such drilling operations.

In contrast to *Burdick* and *Boatman*, Applicant's invention is directed to alleviating the loss of brine fluids into the formation <u>during the recovery of oil and/or gas from the formation</u> in order to protect the formation and thus allow for maximum production from the well. *See*, paragraphs 10, 14 and 15 of Declaration Under 37 CFR § 1.132 of Daniel P. Vollmer (*Vollmer Declaration*"), previously submitted. The Examiner states that the *Vollmer Declaration* is "not relevant because the present claims are not drawn to a fluid loss pill but instead to a method of thickening." (P. 9, 2d full paragraph.) Applicant disagrees. For the most part, the claims of Applicant recite "a method for thickening a brine during the recovery of oil and/or gas from a

subterranean formation . . . in order to alleviate fluid loss into the formation . . . ." A fluid loss pill is defined as a specific fluid which when injected into a well alleviates fluid loss, particularly during completion operations. The drilling mud of *Burdick* and *Boatman* is not used during the completion or workover of a well and the behavior of an aqueous salt solution containing a polymer would be different when used as a drilling mud versus in accordance with the claimed invention. *See*, paragraph 10 of *Vollmer Declaration.*

Applicant has amended the claims to more clearly recite the use of the invention during the recovery of oil and/or gas from a formation. As claimed by Applicant, a brine is thickened by a cellulosic polymer suspended in an aqueous alkali formate. The thickened brine, introduced into the well during completion or workover of the well, alleviates the loss of fluid into the subterranean formation penetrated by the well. As stated in the first paragraph of page 2 of the originally filed specification, it is highly undesirable for such brine to escape into the formation during completion or workover operations. As such, the invention is directed to thickening of brines in order to prevent fluid loss into the formation.

The viscosity of a drilling mud is dramatically less than the viscosity of a fluid loss pill. A drilling mud has a viscosity which is only sufficient to prevent drilled cuttings and other mud solids from settling. The viscosity of a drilling mud must be minimized in order to allow easy circulation into and out of the wellbore. *See*, paragraph 13 of *Vollmer Declaration.*

In any event, it is recognized in the industry that fluid loss control provided by a drilling mud damages the formation and thereby prevents suitable production from the well. In addition, fluid loss control of a drilling mud is derived from the solids contained in the drilling fluid. *See*, for instance, H.C.H. Darley et al, Composition and Properties of Drilling and Completion Fluids, 5th ed., 1988, pp. 15, 289, copy attached, wherein it is stated that fluid loss control in a drilling mud is attributable to the solids content of the mud and not to the viscosity of the mud. Further, a drilling mud cannot function in the claimed invention of Applicants, especially since fluid loss control of a drilling fluid deposits an especially difficult to remove filter cake which inherently damages the formation and inhibits the production of hydrocarbons from the formation. On p. 289, Darley illustrates the fact that fluid loss in drilling muds is controlled by the amount of solids in the mud itself.

In light of the above, the Examiner is therefore respectfully requested to reconsider the rejection of the claims over *Burdick* and *Boatman.*

The Examiner's Rejection Over *Burdick* and *Vollmer*. The Examiner has also rejected Claims 70-76 and 84-90 under 35 U.S.C. § 102(b) as being anticipated by *Burdick* or U.S. Patent No. 5,785,747 ("*Vollmer*"). These grounds of rejection are also traversed.

Burdick, as stated *supra*, is directed to drilling muds. The claims of Applicant recite introduction of the cellulosic suspension during completion or workover of a well. There is no reason to conclude that a drilling mud could function in accordance with the claimed invention.

Vollmer likewise does not anticipate the claimed invention. *Vollmer* teaches the use of a suspension of cellulosic polymer in polyol to viscosify a targeted brine. *Vollmer* does not suggest the use of a cellulosic polymer in an alkali formate to viscosify a brine. No mention is made or even suggested in *Vollmer* for the use of a suspension other than one which does not contain a polyol. Thus, whereas the claims of Applicant are drawn to thickening of a brine with a suspension of cellulosic polymer in an aqueous alkali formate solution, *Vollmer* discloses dispersing a paste (of a cellulosic polymer in a glycol) into an aqueous brine, such as an alkali formate brine (col. 5, ll. 60-65; col. 6, ll. 62-67 – co. 7, l. 27; col. 8, ll. 20-29). *Vollmer* does not disclose suspending the cellulosic polymer into an aqueous alkali formate solution prior to the addition of the cellulosic polymer suspension into the brine to be thickened. Further, Applicant has demonstrated in Tables VI – IX of the originally filed specification that the order of addition of components has a significant impact on the thickened cellulosic polymer containing suspension. For instance, in Example 16, Solution #3 is compared to Solution #4. In Solution #3, a brine fluid (calcium bromide having a density of 14.2 ppg) is thickened with a suspension of hydroxyethyl cellulose (HEC) in an aqueous potassium formate wherein the amount of potassium formate in the alkali formate brine is above 40% by weight. Solution #4 was prepared by adding an aqueous potassium formate solution to calcium bromide brine and then subsequently adding HEC. A dramatic difference in viscosification is illustrated in Table VI between Solution #3 and Solution #4. Similar results are illustrated in Table VII (between Solution #5 and Solution #6 using calcium chloride/calcium bromide brine having a density of 15.1 ppg); Table VIII (between Solution #7 and Solution #8 using calcium bromide/zinc bromide brine having a density of 19.2 ppg); and Table IX (between Solution #9 and Solution #10 using calcium bromide/zinc bromide brine).

Examiner's Rejection Under 35 USC 112. The Examiner has also rejected Claims 70-76 and 84-90 under the first paragraph of 35 U.S.C. § 112 for failing to provide an enabling disclosure.

It is believed that the amendment to Claims 70 and 84 obviates the need for discussion of this rejection.

Examiner's Double Patenting Rejection. The Examiner has further provisionally rejected Claims 19, 23, 25-36 and 38-40 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 3-6 of copending Application No. 10/911,038. Applicant will consider the filing of a Terminal Disclaimer upon indication of allowable subject matter in this application.

Conclusion. In view of the foregoing amendment and remarks it is respectfully submitted that this application is in condition for allowance. Early notice to that effect is earnestly solicited.

Respectfully submitted,

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Composition and Properties of Drilling and Completion Fluids

Fifth Edition

H. C. H. Darley
George R. Gray

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Filtration Properties

The ability of the mud to seal permeable formations exposed by the bit with a thin, low-permeability filter cake is another major requirement for successful completion of the hole. Because the pressure of the mud column must be greater than the formation pore pressure in order to prevent the inflow of formation fluids, the mud would continuously invade permeable formations if a filter cake were not formed.

For a filter cake to form, it is essential that the mud contain some particles of a size only slightly smaller than that of the pore openings of the formation. These particles, which are known as bridging particles, are trapped in the surface pores, while the finer particles are, at first, carried deeper into the formation. The bridged zone in the surface pores begins to trap successively smaller particles, and, in a few seconds, only liquid invades the formation. The suspension of fine particles that enters the formation while the cake is being established is known as the *mud spurt*. The liquid that enters subsequently is known as the *filtrate*.

The rate of filtration and the increase in cake thickness depend on whether or not the surface of the cake is being subjected to fluid or mechanical erosion during the filtration process. When the mud is static, the filtrate volume and the cake thickness increase in proportion to the square root of time (hence, at a decreasing rate). Under dynamic conditions, the surface of the cake is subjected to erosion at a constant rate, and when the rate of growth of the filter cake becomes equal to the rate of erosion, the thickness of the cake and the rate of filtration remain constant. In the well, because of erosion by the mud and because of mechanical wear by the drill string, filtration is dynamic while drilling is proceeding; however, it is static during round trips. All routine testing of filtration properties is made under static conditions because dynamic tests are time-consuming and require elaborate equipment. Thus, filtration rates and cake thicknesses measured in surface tests correlate only approximately to those prevailing downhole and can be grossly misleading. The permeability of the filter cake—which may readily be calculated from static test data—is a better criterion because it is the fundamental factor controlling both static and dynamic filtration.

The permeability of the filter cake depends on the particle size distribution in the mud and on the electrochemical conditions. In general, the more particles there are in the colloidal size range, the lower the cake permeability. The presence of soluble salts in clay muds increases the permeability of the filter cake sharply, but certain organic colloids enable low cake permeabilities to be obtained even in saturated salt solutions. Thinners usually decrease cake permeabilities because they disperse clay aggregates to smaller particles.

The filtration properties required for the successful completion of a well depend largely on the nature of the formations to be drilled. Stable formations with low permeabilities, such as dense carbonates, sandstones, and lithified shales, can usually be drilled with little or no control of filtration properties. But many

The Filter Cake

Cake Thickness

Although cake thickness is the vital factor in problems associated with tight hole, pipe torque and drag, and differential sticking, little attention has been paid to it in the literature. Cake thickness is assumed to be proportional to filter loss, and therefore only filter loss needs to be specified. Actually, although cake thickness *is* related to filter loss, the specific relationship varies from mud to mud, because the value of Q_m/Q_f in Equation 6–6 depends on the concentration of solids in the mud and on the amount of water retained in the cake. The filter loss decreases with increase in the concentration of solids, but the cake volume increases, as shown in Figure 6–4. If an operator adds extra clay to a mud to reduce filter loss, he may believe that he is also reducing cake thickness, but he is actually increasing it.

The amount of water retained in the cakes of muds with different clay bases depends on the swelling properties of the clay minerals involved. Bentonite, for example, has strong swelling properties, and bentonitic cakes therefore

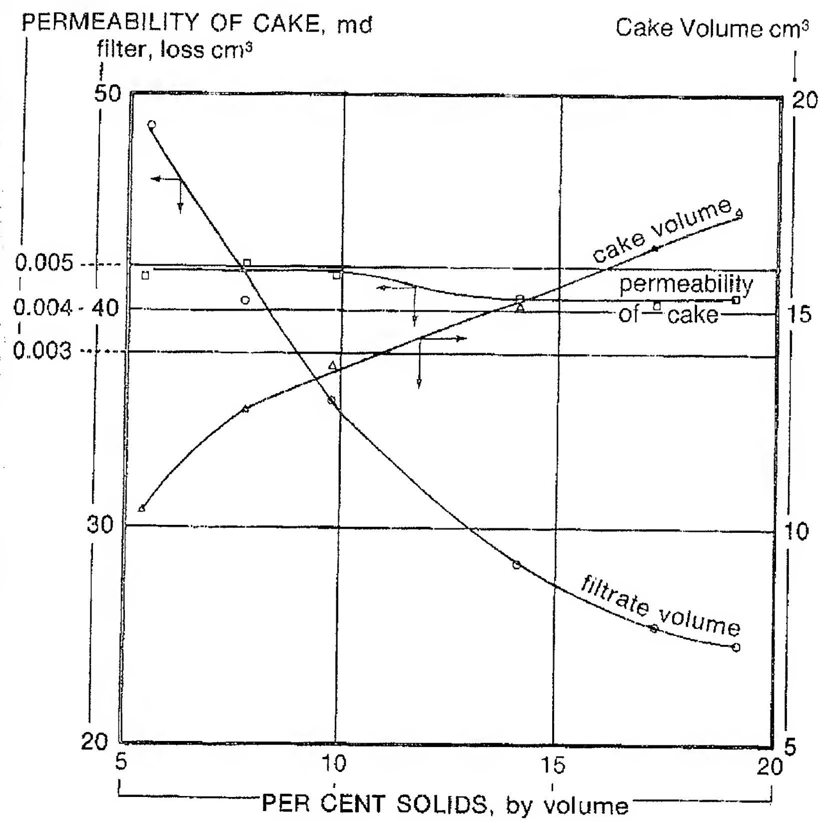

Figure 6-4. Variation of filtrate volume, cake volume, and permeability with concentration of solids in a suspension of Altwarmbüchen clay. (*Data from von Engelhardt and Schinedwolf.*)[3]